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TELEVISION CLUB.

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THE BRITISH AMATEUR TELEVISION CLUB

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WHO TO WRITE TO

Subscriptions and changes of address should be sent to the Treasurer, and membership enquiries to the Membership Secretary. Please only address your enquiries to the most suitable committee member.

THE EDITOR Andrew Hughes, 17 Woodside Avenue, Weston Green, Esher, Surrey, KT10 8JQ

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Letters to the Editor

Dear Sir,

In 1976 the New Zealand Association of Radio Transmitters (NZART) is holding its Golden Jubilee to represent 50 years of service, from 1926 to 1976. We are holding a large Conference in Auckland, New Zealand and are interested in inviting groups of radio amateurs from any and all overseas countries for this conference, and the celebrations, on the 4th - 12th June 1976. We have arranged a group booking of flights with Air New Zealand for all parts of the world. We have had a card printed which can be sent to the airline for full details of the conference, the flight and the country (cards available from Editor C Q - T V).

There will be many attractions at the Jubilee Conference, including Mobile Rallies, Trade Display, SSTV, RTTY together with bus trips and fox hunts.

There is no obligation involved in sending in a card and we invite you all to do so.

Robert Leyland ZL1TRM
(Auckland Branch of NZART)

....

Dear Sir,

The R.S.G.B. have issued yet another band plan for 2m and we have shown SSTV on 144.5. This does not seem practical as many Transceivers do not cover this frequency, and I would therefore like to suggest a frequency which is easily remembered and can be used with all SSB Transceivers.

The coverage of commercial equipment is limited, e.g.

Linear 2	144.1 - 144.33
Trio 7010	144.1 - 144.295
Modified Trio 7010	144.2 - 144.395

This means that the only frequencies which are obtainable by all Transceivers are between 144.2 and 144.3. As 144.3 is to be the new calling frequency this is rather close to the present SSTV frequency of 144.28. Therefore it is suggested that 144.23 be used as the SSTV frequency. This is very easily remembered as the frequency used on 20m is 14.23.

The new frequency could be used as from when 144.28 becomes a sound stations only frequency.

M.T. Crampton T.Eng. (CEI) A.M.I.M.I.
G8DLX, G6AHJ/T
Rugby

....

POSTBAG

Prof. Franco Fanti I1LCF of Bologna, Italy, sent the results of the World SSTV contest which he organised, and mentioned that he is continuing his interest in FAX. Despite some interest over here he notes that he has heard no G's on the air with this system, and wonders if there may be some soon.

Johnny Brown G3LPB in Cornwall has started writing some slow scan articles for C Q - T V (more will appear in future issues); his wide experience should prove useful to us all. He asks us to stop a rumour which has been floating about that Western Electronics are producing a monitor for £80. They deny completely black on white that this is so! However, Johnny points out that they are agents for Hamvision and have been doing demonstrations at various clubs.

Arthur Critchley has at last moved to Canada and is living and working in Ontario. He writes about his new home in glowing colours (except, he says, NTSC is AWFUL) and perhaps we may see him one day on the air. His new address is 6 Abercom Road, Markham, Ontario, but for those of you who wish to buy printed circuit boards for his "C Q - T V SPG" he has made arrangements for Grant Dixon to market them through "Club Sales". See the back page advert.

ATV AND THE IARU WARSAW CONFERENCE AS IT AFFECTS THE BRITISH AMATEUR

At the April 1975 conference of the International Amateur Radio Union amended band plans were agreed by all member countries and certain recommendations were made regarding ATV operation as follows.

70 cm band

vision carrier frequency	439.25 Mc/s (625 line vestigial sideband)
sound carrier frequency	433.25 Mc/s (for 6.0 Mc/s separation)
sound carrier frequency	433.75 Mc/s (for 5.5 Mc/s separation)

23 cm band

ATV repeater segment	input	1250 to 1260 Mc/s
	output	1283 to 1293 Mc/s
ATV segment		1261.5 to 1283 Mc/s

COMMENT

The 70 cm vision carrier is too close to the band edge for the British 625 line system which has a lower sideband width of 1.25 Mc/s. In order to fit into the alloted band width of 432 to 440 Mc/s a transmission on the British system will have to have a vision carrier between 438.10 and 432.75 Mc/s.

The 23 cm band plan does not fit exactly the present allocation of 1225 to 1290 Mc/s. The ATV segment is in the middle and allows at least two 8 Mc/s TV channels and so should be adequate for present use.

SSTV

SSTV operation is recommended at 3.735, 7.040, 14.230, 21.340 and 28.670 Mc/s all $\pm$ 5 Kc/s in the HF bands and at 144.5, 432.5, and 1296.5 Mc/s in the VHF bands with FAX on 144.7, 432.7, and 1296.7 Mc/s.

The 7.04 Mc/s recommendation also corresponds with the RTTY frequency which is unfortunate and the 144.5 Mc/s recommendation is also used by the RSGB news service between 1000 and 1130 on Sundays. SSTV'ers should avoid this frequency during the news broadcasts.

NEW ASSOCIATION INAUGURATED

A few years ago, D.B. Pitt of Nottingham, who had retained a long-standing affection for the Low Definition Television apparatus of the early thirties, came to the conclusion that a serious revival of activity in this field was feasible. This belief was based on certain technical considerations.

1. The acceptance of sound recording into the domestic scene, and the consequent general availability of tape machines with a bandwidth neatly fitting that required for LDTV.
2. The more recent arrival of two-channel (stereo) equipment, offering the immediate bonus of synchronised sound to accompany the picture on the first track.
3. The semi-conductor revolution, simplifying construction.
4. The more recent extension of the semi-conductor technology into the field of opto-electronics.
5. The arrival of integrated circuits, permitting the assembly of highly sophisticated circuitry at modest cost and in compact form.
6. The recent improvements in flexible light-guides, polarising materials etc., greatly simplifying optical arrangements.

During 1972 and 1973 a number of advertisements and appeals were placed in journals and periodicals, and responses to these resulted in the establishement of a fair-sized group of correspondents with a common interest in LDTV and united by a small but regular news-letter.

On Saturday April 26th, at the Nottingham College of Education, the first National LDTV Convention was held. This meeting which consisted of an exhibition of LDTV apparatus, ancient and modern, followed by a discussion, resulted in the inauguration of a formal association.

A steering committee to direct the association's affairs was formed of S. Kujawinski and A. Richards (Nottingham), H.J. Peachey, MRTS., (London), D. Jones and L. Willis (Derby), P.A. Harrison, (Carlisle), D.J. Sumner, G3FVH (Horsham), and C.J. Burkill G8FPU, (Birmingham).

The presence of Mr. H.J. Peachey, one of the Royal Television Society's oldest Members, provides a strong link with the past, while the declared interest of some twelve liceced radio amateurs seems to promise a rapid expansion in the field of LDTV broadcasting in the not-too-distant future.

Tribute was paid to the energy and enthusiasm of C.J. Long, the young Australian LDTV worker who provided enormous practical help, and collaborated in establishing the first trans-world LDTV tape-link.

Mr. F.C. Ward, G2CVV, Secretary of Derby and District Amateur Radio Society, accepted the association s invitation to become its first President.

D.B. Pitt (Chairman)

TV ON THE AIR

By John L. Wood G6AHT/T G3YQC

For many years now reports on amateur television activity and achievements have been rather sparse, in fact, a lot of activity information is not reported at all. Consequently one gains the impression that TV activity is rather low, and therefore poses the question to the would-be newcomer "Is it worth-while setting up a station?". The answer is "Yes" and it is hoped through this column to show people just how much real activity there is in amateur television.

The purpose of this column is to report on the non-technical side of ATV, so, if you are active, doing anything special, achieve any outstanding contacts, in fact anything concerned with activity please let me know.

Stations regularly on the air include the following:-
(Transmitting stations first) From Newcastle-on-Tyne comes G6ALT/T (G3YRH), and G6ACK/T G8ACK. G6AGC/T (G8AXC) Scarborough, G6AHW/T (G8DXG) Sheffield, and G6AEP/T (G8CUE) Rotherham.
Moving South there is G6MUR/T Leicester, G6AHJ/T (G8DLX) Rugby, G6MXW/T Warley, G6KQJ/T (G8ACB) Wolverhampton, F6BQH/T Calais. And to the east G6ACH/T (G3PTU) Huntingdon.

Among listening stations are G4DSC Ripon, G8HBQ Leeds, G8EOP Dewsbury, G4CNJ Nottingham, and G3FUW Hinkley.

Please let me know of any others in your area.

The majority of these stations are also active on 2 meters, and this band would seem ideal for contacting other TVers.

One reason for this is that arbitary listening for TV on 70 cms. is rather hit and miss, (mostly miss!) and one is fortunate to intercept a TV QSO.

Mentioning your television activity during an ordinary 2m QSO often reveals a surprising number of similarly interested stations.

The next contest is on September the 13th and 14th (rules in C Q - T V No. 90). This is a golden opportunity, as one can be sure that there will be stations on. One plea- please put in an entry no matter how low your score seems, the published results are as good as a European advertisement and proves our activity in the UK.

It has been suggested that a 2 meter calling channel be set up for amatuer TV contacts, surely a very sensible move; comments please.

Please send contributions for this column to:- 54 Elkington Road, Yelvertoft, Northampton NN6 7LU.

So 73 till next time.

THE CLUB'S CURRENT FINANCES

Elesewhere in this issue you will find the Accounts of the Club for the year ended 31st December 1974. These show a surplus of £209 and as the Club is not run for the purpose of making a profit this seems adequate, if not excessive.

However, the Club must have reserves to fall back on and as only a General Meeting can raise subscriptions or take other remedial action these reserves should be sufficient to finance the Club until the next Meeting, i.e. two year's running expenses. In 1973 these amounted to £854 and in 1974 to £1048 and as expenses are increasing our reserves ought to be £2000+. At 31st December 1974 they amounted to £1269 in a Building Society and I have had to withdraw £200 of these already this year.

The heaviest expense is, rightly, the production of C Q - T V, currently costing £250 per issue with postage. Out of every £1 subscription the Post Office receives 26p, leaving 74p for production costs and running expenses of the Club!!

A further fairly heavy cost is the 'processing' of new Members. By the time application forms, stationery, addressograph plates, postage tec. are taken into account it costs the Club 38p to enrol a Member. This is why new Members are asked to pay the balance of the current year's subscription plus the whole of the next year's subscription on joining. In spite of this, of the average of 220 who leave each year about 150 have been members for less than two years, and as most do not formally resign, but just cease paying the subscription, it involves the Club in further expense as they receive the first two C Q - T Vs of the year as Members are not struck off until June.

You will not have to be too intelligent to realise by now that this is going to cost you! The Club cannot cut expenses - no official or Committee Member is paid, so no wages can be cut and the total expenses excepting those relating to C Q - T V are negligable. The alternative is to increase income.

The Committee has discussed various remedies and would like YOUR comments on the following:

a. An increase in subscriptions. If so, how much? With Bankers orders it is expensive increasing subs every year or so, so an increase should take into account inflation over the next say, 4 years. Odd pence are awkward to deal with, so should it be £1.50 or even £2.00

b. An admission fee. If so should it just cover costs, say, 50p or should it also be to deter Members from joining for a relatively short time, say, £1 - £5 (Deter Members???)

c. A combination of (a) and (b).

d. Any other suggestions?

The Committee does require your comments in order to formulate some specific resolutions for the next General Meeting in 1976. With Meetings only once every three months or so we have not a lot of time. Suggestions can be sent to any Committee Member, or to me, but if you require a reply, please enclose a stamped addressed envelope, and be prepared for a delay as we hope the post will be heavy.

EDITOR'S NOTE

This was written by the Treasurer before the announcement by the Post Office of further rises in postal charges. The urgency of solving our financial problems can now only be more acute.

Slow Scan News

RESULTS OF THE 5th WORLDWIDE SSTV CONTEST

U.S.A.

1.	WB4ECE	(101+0) x / (5x6) + (2x44) /	11.918
2.	W9NTP	(91+4) x / (5x3) + (2x41) /	8.370
3.	WA1NXR	(87+3) x / (5x3) + (2x41) / 9.215 - 6%	8.663
4.	WB9LVI	(72+0) x / (3x5) + (2x39) /	6.696
5.	K9BTU	(38+0) x / (5x2) + (2x19) /	1.824
6.	W7FEN	Control Log.	

OUT U.S.A.

1.	G3IAD	(62+1) x / (5x3) + (2x34) /	5.229
2.	G8PY	(49+1) x /(5x4) + (2x28) /	3.800
3.	EA4DT	(36+0) x /(5x4) + (2x38) /	3.456
4.	EA510	(46+0) x /(5x2) +(2x15) /	1.840
5.	OH5RM	(36+0) x / (5x2) + (2x12) /	1.224
6.	DK5EL	(23+1) x / (5x3) + (2x16) /	1.128
7.	G3OXZ	(24+0) x / (5x4) + (2x14) /	1.056
8.	OK3ØZAS	(29+0) x / (5x2) + (2x13)	1.044
9.	I1RHB	(23+0) x / (5x2) + (2x14) /	.874
10.	I1YBM	(20+0) x / (5x3) + (2x13) /	.820
11.	IØSSX	(21+0) x / (5x3) + (2x12) /	.819
12.	HA5FA	(21+0) x / (5x2) + (2x12) /	.714
13.	HA2KRB	(18+0) x / (5x3) + (2x12) /	.702
14.	OZ1AT	(20+0) x / (5x2) + (2x12) /	.680
15.	OK1JSU	(19+0) x / (5x3) + (2x10) /	.665
16.	SM4MI	(20+0) x / (5x3) + (2x8) /	.620
17.	18MGQ	(22+0) x / (5x1) + (2x10) /	.550
18.	13HDC	(13+0) x / (5x2) + (2x11) /	.416
19.	ISØPEM	(14+0) x / (5x2) + (2x8) /	.364

S.W.L.

1.	IØMHC	(44+0) x / (5x3) + (2x19) /	2.332
2.	G3MGF	(40+0) x / (5x3) + (2x17) /	1.960
3.	I4-20710	(26+0) x / (5x3) + (2x15) /	1.170
4.	DJ6KA	(27+0) x / (5x3) + (2x12) /	1.053
5.	ONL-2717	(16+0) x / (5x2) + (2x12) /	.544
6.	LØ4-18710	(11+0) x / (5x3) + (2x7) /	.319
7.	I3-14258	(7+0) x / (5x2) + (2x6) /	.154

SLOW SCAN 1975

AS VIEWED BY A LF, HF AND VHF BANDS SSTV OPERATOR

The 5th World SSTV Contest duly took place in February 1975 and produced the shambles expected when there are two sets of rules for an all-video-only contest. Because the Americans maintain that their FCC require 'vocal station identification' at the start and end of each QSO, this is permitted them but to no other part of the world, who in their turn used video, and video only throughout. When station identification becomes "CQ SSTV Contest, this is WB4... calling for slow scan contacts etc.", barely exchanges RST and serial number in video, and then ASKS THE OTHER STATION ON PHONE did he receive the report ok? etc., and the other station likewise on phone, asks for a repeat WHICH IS GIVEN ON PHONE, surely the time has come for one set of rules with Worldwide application!

European SSTV transmissions are around 3735 - 40 KHz. The British Sunday SSTV Net meets around 3735 KHz from 0800 clocktime; the 144.280 mcs. nightly activity from 2100 clocktime will move to 144.5 calling frequency on the Warsaw Convention recommendations.

Whenever and to wherever the bands are open SSTV can be found around 14230 ± 8 KHz, 21340 and 28680; W8YEK has had 2xSSTV QSOs with at least 103 countries, and G3IAD with 84 countries and 48 States all in less than 18 months.

Some 150 "Home Office 2 year permits to transmit slow scan television" are reputed to be in force but no official list is published. G3WW's private list of known SSTV operators and Monitor owners contain less than half that number. A central register would help the active SSTV operators answer the questions repeatedly asked of them as to "Where can I see SSTV in operation in my district", be it commercial, homemade or of a special design or circuit.

SSTV was developed in the USA and British amateurs took part in the original tests with them. Such developments continue as evidenced by the last three Annual Three-Day Dayton Hamventions in Ohio.

The SSTV keyboard designed by WØLMD was exhibited there in April 1973, "borrowed" to win the 1974 World SSTV Contest. and became the subject of a constructional article in "CQ Magazine" September 1974. Howard Waton, G3GGJ, using a PC Board made by W8OZA "with all necessary paperwork", made the first in-Europe WØLMD-type SSTV keyboard which operates with excellent results. Only recently has the WB4HCV commercially-made version appeared in HB9 and OD5 countries. These keyboards produce five lines of six characters each but as erasings single typing error erases everything at one fell swoop W3GKW has designed a single character plug-in "Rub out" circuit using 5 ICs, and also a display by a pair of LEDs to keep track of the number of characters typed "up and down".

The chief objection voiced against SSTV is the length of time ($7\frac{1}{2}$ seconds for a full frame) it takes the picture to unfold, and by then the top half has as good as disappeared; how nice it would be therefore if the whole picture could be "frozen" for viewing, but at amateur prices unlike the already available commercial units (made for different purposes) which cost thousands of dollars.

At Dayton 1974 four such "freezing" converters for amateur use were displayed by W9NTP, WØLMD, WB9LVI and VE3GZM with VE3DVV to the attending 8000 who often packed ten deep around these exhibits.

Each convertoer used digital storage techniques to convert an incoming SSTV signal into a CONSTANT brightness display on a Standard TV set.

WØLMD published his design last October in pamphlet form, since modified and improved (PC Boards available); "QST"March and May 1975 carried articles by WB9LVI on his design, and PC Boards will be available in the autumn. Both these converters have 67, 584 bits of recirculating frame memory provided by sixty-four type 2525 LSI MOS dynamic shift registers having 1024 bits of storage each, and four 512 bit registers. Originally the 2525s were $9.00 each = $576.0 plus "non memory" logic at about $150.0; happily ex-equipment units were tracked down at 25 cents each but with at least 50% mortality. Prices in the U.K. were £2.00 each new, with no known ex-equipment sources. What is wanted is an up-to-date British design for this conversion, and for fast-to-slow scan unitilizing the latest in RAMS etc. and NOW.

The Venus SSTV Monitor incorporates a Video Analyser, and is now available in kit form; ROBOT Research Inc. have added this facility and Fast Scan monitoring (from the camera) to their January 1975 Model 70B by a three position switch. In the same month's issue of "73 Magazine" WB8DQT in"SSTV Video Analysis of TV Signal" showed how by simply and easily incorporating "in any monitor" a DPDT switch and a 10 mf capacitor this is achieved; specific monitor circuits mentioned are WB8DQT's, WØORX's (The Copland Macdonald who "started" SSTV and whose prototype monitor is used by a GM5...), W9LUO's (QST. March 1970), W4TB's (73 SSTV Handbook obtainable from B.A.T.C. Sales), W6MXV's and the ROBOT circuit if an aditional simple circuit is connected to the limiter input.

"ANY MONITOR" should surely include the current UK circuits used in the G3RHI, MK Products and Spacemark SSM-1 monitors, sucessfully in the latter two according to G3GRJ; both G3IAD and G3WW recommend the DJ 6 HP SSB/SSTV Bandpass filter (DL-CQ. August 1974).

This year's Dayton attracted 1200 visitors over the three day period. Taking as a basis for a lecture and demonstration last year's slow to fast scan "freezing" converter, "long persistence tubes, like the 5FP7s being definitely obsolete since last year", speakers at the SSTV Forum described in detail what had been accomplished in the past year, with "working models" on show in the ATV Booths, and what was promised for 1976 (if not before). From reports by video and SSB, plus five cassettes of the SSTV Forum lectures generously arranged and provided by W8OZA "for those unable to be present", we learn of W6MXV's Fast to Slow Scan Line Converter to enable any tv camera, monitored on a normal tv screen, to transmit SSTV pictures without any modification or slow scan monitoring (PC Boards and full size kits available); WØLMD's "Keyboard Titler" to overprint video from camera or tape etc.(articles thereon in Autumn issues of "CQ Magazine") and his microprocessor (on the Saturday he promised a FULL lecture on it of 90 minutes on the Sunday!); WB8DQT and WA7MOV talked enchantingly on weather Satelites, the equipment needed, with PC Boards available etc.;W9NTP promised full colour SSTV next year with full movement, while WB9LVI added ti his QST converter articles 3D viewing of the moving colour SSTV.

A visiting SSTVer was enthralled by ROBOT's new Model 300 storage tubed Slow/Fast and

Fast/Slow Scan "frozen picture" Converter displaying the picture on a large sized normal tv set, but the price is $1295.0; WB4HCV hopes to demonstrate his version at around $800.0 at the Atlanta Convention this summer.

JULY 1975.

E & OE, 73s Richard Thurlow G3WW

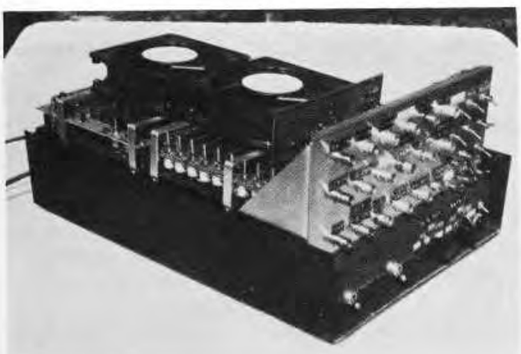
A DIGITAL SCAN CONVERTOR FOR COLOUR SLOW SCAN TELEVISION

Shown in the photograph is a colour slow scan digital scan convertor designed by W9NTP. The scan convertor utilises three 128x128x4 dynamic shift register memories and performs both comera and display functions. The basic timing circuit is based on the slow to fast scan convertor design of WOLMD.

The colour slow scan system can load the three colour memories in 3-1/60 second periods by means of a single camera with a colour wheel. Simultaneous transmission of the three colour channels is effected by using a subcarrier at 500 Hz with quadrature modulation, while the luminance channel is transmitted as a regular slow scan signal at 1200 to 2300 Hz. Colour pictures are viewed on a commercial Zenith colour tv set.

Development work will continue and will include rapid update of the centre of the picture, additional resolution in the luminance, or green chennel, and reduced resolution in the other two colour channels for memory size reduction.

The unit was demonstrated at the Dayton Hamvention, April 25th, 1975. Any experimenters wishing to correspond with the designer should write to Don C. Miller W9NTP, Waldron, Indiana 46182, U.S.A.



BATC

SSTV Convention.

PLACE	ASTON UNIVERSITY, BIRMINGHAM
DATE	OCTOBER 11th 1975
TIME	0900 - 1800
DETAILS	Mike Crampton G8DLX 16 Percival Road, Rugby, Warwickshire.

Final details of this Convention are still being arranged, but facilities will exist for members to display their equipment, and lectures on SSTV topics will be delivered. It is hoped that some commercial equipment manufacturers will be running stands.

A Convention fee of 50p will be payable by the attending to defray costs of organising the event; a small B.A.T.C. subsidy will be made available to cover the remaining costs. Lunch can be provided at the University for a reasonable charge.

COME TO THE CONVENTION; BRING YOUR EQUIPMENT FOR DISPLAY; BRING YOUR FRIENDS TO SEE WHAT SSTV IS; BRING ENTHUSIASM AND EXPERIENCE.

SLOW SCAN   Where is it going?

by L. ELMER G6AGU/T

In the early 1960's the standards being used by WAONLQ (then WAsBCW) were:-

Line frequency 20 Hz (=60/3)	number of lines 120
field rate 6 secs modulation AM	aspect ratio 1:1

whilst G3AST was experimenting on the following standards:-

Line frequency 25 Hz (=50/2)	number of lines 125
field rate 5 secs modulation FM	aspect ratio 4:3

These early standards were governed by the equipment available at the time, for example, the line frequency was derived from the power supply for ease of generation and the number of lines was governed by the simple valve type dividers which could be built. Some of this early circuitry appeared in C Q - T V No. 41 and 42 and a pulse generator using gas filled counters appeared in C Q - T V No. 45. As a result of the experience gained in using these standards WAONLQ later proposed the standards which are now internationally accepted.

What does the future hold for SSTV?? Let us look at our present system to see what improvements can be made. The off air picutres displayed on many monitors seem to suffer from the following defects; poor synchronisation, picture break up caused by interference, poor contrast and indistinct image due to limitaitons of the P7 phosphor.

Poor synchronisation will be noticed as ragged certicals or as individual lines displaced horizontally from their true position. Occasionally during a burst of interference, the frame sync pulse will be missed and this will cause the next picture to be displaced vertically or, if the monitor has triggered timebase, to be lost. If the monitor was driven from a sync pulse generator which was phase locked to the incomming video signal then a noticeable improvement in synchronisation would result and the monitor would continue to scan correctly during periods of severe interference.

If we do this then what sync pulses are really necessary? The line sync pulse is very much longer than the flyback time of most monitors and occupies a large slice of the line scan period which could usefully be used for video. Can phase lock be maintained by the frame sync pulse alone? The answer is yes, but would the 8 second response time be too sluggish? This depends upon the error between the SPG master oscillators at transmitting and receiving ends. A 1% error between transmitter and receiver power supplies will result in vertical lines being received as diagonal lines with a displacement of one whole line in 100 lines. This is clearly not good enough, so crystal controlled oscillators will have to be used and the frequency tolerance should be better than 0.01% A suggested scheme which gets rid of the line sync pulse and yet allows the phase lock loop to work at line rate is to reverse the modulation sense on alternate lines. Thus even numbered lines would be transmitted as 1500 Hz black and 2300 Hz white as at present but odd numbered lines would be transmitted as 1500 Hz white and 23oo Hz black. The demodulated signal would then have a strong component at half line rate to operate the phase lock loop. This still leaves the frame sync pulse. Some means must be provided to establish

synchronisation when the transmission starts, and once this has been done, synchronisation will be maintained by the SPG. One way might be to introduce a series of black to white transitions on the last line in some pre- coded manner which would be detected at the receiving end.

Turning now to the picture quality as displayed on a 5FP7 or similar tube, the main fault is that, when the scanning line has reached the bottom of the screen, the picture at the top has vanished. What is needed is some way of displaying the picture at a fast rate whilst receiving at the normal slow scan rate. Some form of storage must be used whereby the picture can be recorded at the slow rate and be replayed at the fast rate.

The first solution is very simple and is to record the signal on a tape recorder at $3\frac{3}{4}$ inches per second and replay it at 15 inches per second into a modified monitor. The monitor would have to be modified to scan at 4 times the line and frame frequencies and this would give a new picutre every two seconds which is much more acceptable. Do not forget also that the audio frequencies from the tape will be multiplied by 4 and this will involve changes to any filters and the discriminator. However, this solution does not allow you to view the picture at the fast rate as it is being received.

The most elegant solution involves some form of storage which can be continuously scanned at the fast rate and at the same time be refreshed at the slow rate. Such storage is provided by magnetic drums, integrated circuit shift registers, magnetic core stores and RAM's (Integrated circuit random access memories) of which the RAM seems the most promising for the experimenter. Before looking at how the picture is stored let us look at some possible fast scan standards.

For our first scheme we would adopt a system which is similar to that used in samplig cameras. Here the horizontal scanning rate is the same as the slow scan line frequency but the vertical scanning rate is 128 times the line frequency (approx. 2 KHz), the scanning lines therefore appear vertical. This is the simplest system. The monitor could also be used to display the output from a sampling camera. Indeed, a commercial monitor to this standard is available from Robot to go with their sampling camera and the picture as displayed on this monitor gives an indication of the sort of picture to be expected from this system. It is necessary to use a tube with a P7 phosphor since the picture rate is still not fast enough to eliminate flicker. To do this we have to scan at least 48 pictures per second. Note that there is a simple relationship between the fast and slow scan rates, the fast scan has moved one line in the same time that the slow scan has moved one picture element. Our next simple relationship is when the fast scan has moved one frame in that same time but this is too high to be of any practical use.

It is only necessary to increase our fast scan rate 3 or 4 times to eliminate flicker, however the relationship between fast and slow scan rates is no longer single. By the time our second slow scan element has arrived our fast scan is much further ahead of this position and will not be there again until a quarter of the line has been received. This applies whether we scan normally or vertically as in the first scheme. We must therefore provide a quarter line buffer store to hold the incomming picture until our fast scan display can accept it. This applies to the first two types of storage mentioned, with magnetic core stores and RAM's it is possible to switch from one element to another and back again so buffer storage is not needed.

This second scheme can be used with the scan coils at 90 degrees from or in their normal position and can use a tube with a P4 phosphor. It still generates a 128 line picture and the fast scan rate is a multiple of the slow scan rate.

The third scheme is to use a standard 625 line (or 525 line) TV monitor to display the picture. The fast and slow scan rates can be unrelated. There are many more lines in the fast scan system than in the slow scan system so it will be necessary to repeat each slow scan line a number of times. In the 625 line system the number of active scanning lines is exactly $4\frac{1}{2}$ times the number of lines in the slow scan system so we must repeat our lines in a 3:2:2:2 sequence starting from line 24 and in a 2:2:3:2 sequence starting from line 337 on the interlaced scan. For the 525 line system the number of active scanning lines is 3.875 times the number of slow scan lines so we can simplify our system and just repeat each line twice. This will mean that a few lines at the bottom of the picture will not be seen. This simplification could also be used with the 625 line system if you do not mind a border at the bottom and top of the picture. There will always be a border down each side of the picture since we are displaying a square slow scan picture on a rectangular screen. This system will be discussed in more detail later.

Turning now to methods of storage, the magnetic core can be used to store a picture in analogue or digital form and is suitable for schemes 1 and 2. It should have 128 data tracks each with its own read/write head and a synchronisation track. There is one track for each line of the picutre. Its speed must be synchronised with the picture, i.e. 900 or 1000 RPM for sceme 1 and 3600 or 3000 RPM for scheme 2. During operation one track will be in write mode and all other tracks will be in read mode. The track being written to will change as each new line is received. The fast scan monitor will sample the output from the tracks in sequence and display one picture element from each vertical line. For use with scheme 2 an extra buffer will have to be provided to store the incomming line until it can be written to the drum. Suitable ex-xomputer drums are available on the surplus market.

The integral circuit shift register is very much faster than the drum and can be used with all 3 shcemes. It is available in a number of configurations, e.g. 4x128 bits, 2x256 bits, 4x256 bits. etc. Data are placed on the input terminals and shifted along one position for each clock pulse until the output terminal is reached. If this output terminal is now connected to the input terminal the data can be made to re-circulate through the register thus allowing us to display the same line many times. Since the clock frequency can be easily changed it is possible to put data into the register at a different rate from that at which it is taken out. A total of 65536 bits will be required to store a SSTV picture.

The previous two types of storage operate sequentially, i.e. the same picture element will not be available again until the drum has made one complete revolution or the shift register has gone through a complete cycle. With the magnetic core store and the RAM it is possible to hve have access to any picture element in any sequence.

The magnetic core store contains a number of planes consisting of a matrix of X and Y drive wire at right angles to each other with a tiny ferrite torroid at the intersection of each drive wire. The corresponding X and Y drive wires in each plane are connected together in series. Also all cores in the same plane have a sense wire and an inhibit wire threaded through them so

each core has four wires going through it. The cores hold data being magnetised in one of two directions. To read from the store a current is passed through an X and Y drive wire. Only the core that is threaded by both wires will become magnetised, the current through one wire alone is not sufficient to affect the core. If this magnetisation is a reversal of its previous direction of magnetisation then a current is induced in the sense wire. The two directions of magnetisation represent a bianry 0 or 1 state. In reading we set all the cores to the 0 state and any that were previously in the 1 state will induce a current in the sencse wire to set the bistables in the external circuitry. Reading has therefore destroyed the original content of the store and if we wish to retain this information we must write it back again while we still have it in the external bistables Thus a read cycle is always followed by a write cycle. To write to the store we simply reverse the current through X and Y drive wires which will set the cores to the 1 state. If the core originally contained a 0 we do not wish to set it to a 1 so we send a current pulse through the inhibit wire, which is threaded in the opposite direction to the drive wires, to prevent this happening. The current pulses are of the order of 300 to 500 MA and 250 to 5000 ns duration depending upon the type of cores. Thecycle time of the store is the time required for a complete read and write cycle and is typically 500 ns to 10 microseconds. This type of store is suitable for use with schemes 1 and 2 and can be used with scheme 3 if the cycle time is shorter than 1.2 microseconds. These stores are available on the surplus market and suitable types are 16384x4 bit, 8192x8 bit or 4096x16 bits, however they will most probably be of the 5 to 10 microsecond cycle time type.

Random Access Memories are probably the best type of storage to use. Their cost, at present is high, but price reductions are announced almost every month. Two basic types are available, static RAM's such as theINTEL 2102 and the dynamic RAM's such as the INTEL 2107. In the static type the data is stored in bistable circuitry within the chip and is retained as long as the power supply is on. With the dynamic type the data is stored as a charge on a capacitor, this slowly leaks away and has to be refreshed. This is done by performing a read cycle on all the rows of capacitors in the store every millisecond. The dynamic types are usually cheaper than the static types but either type may be used to store a SSTV picture. Refreshing the dynamic type is not a problem in this application since we will be sequentially reading from the store and this automatically refreshes it. They are available in 1024 and 4096 bits and in 16, 18, and 22 pin DIL packages. All address decoding is done on the chip but some of the 16 pin types have multiplexed address inputs which calls for more external circuitry. They are all fast and cycle times are usually less than a microsecond. Note that unlike the core store it is not necessary to follow each read cycle with a write cycle since the stored data is not destroyed on reading out. They are suitable for use with all three display schemes and the number needed to store a SSTV picture is 16 of the 4096 bit types or 64 of the 1024 bit types.

In the next part of this article we will discuss analogue to digital conversion and the slow to fast scan converter in more detail, meanwhile if any reader has any comment to make the author would be pleased to hear from you.

A VIDEO MODULATOR

By J.L Wood G6AHT/T

It seems, by talking to people on the air that some are having difficulty in locating a design for a modulator producing negative going video. This therefore is a well tried and simple design which it is hoped will meet the needs of those in difficulty.

This circuit is simple to construct and operate and has adequate bandwidth to accomodate the 625 line standard.

The circuit is fairly conventional and needs little explanation. Positive going composite video is a.c. coupled to a two stage video amplifier which has a fixed gain, and uses a complementary pair of transistors, the output of the amplifier is fed to the grid of V2 which together with V1 forms a 'Totem pole' output stage. DC restoration is effected in this stage as is the inversion of the video signal.

The output level of the modulator is adjusted by the gain control RV1. V2 cathode is held at 10 volts by a zener diode.

If possible the +15 v rail for the transistor amplifier should be obtained from a separate stabilized supply. It can however, be dropped from the 420 v rail as shown in the circuit diagram. The 18k resistor should be adjusted during testing.

After assembly check the wiring over carefully and make sure the diodes are the right way round!

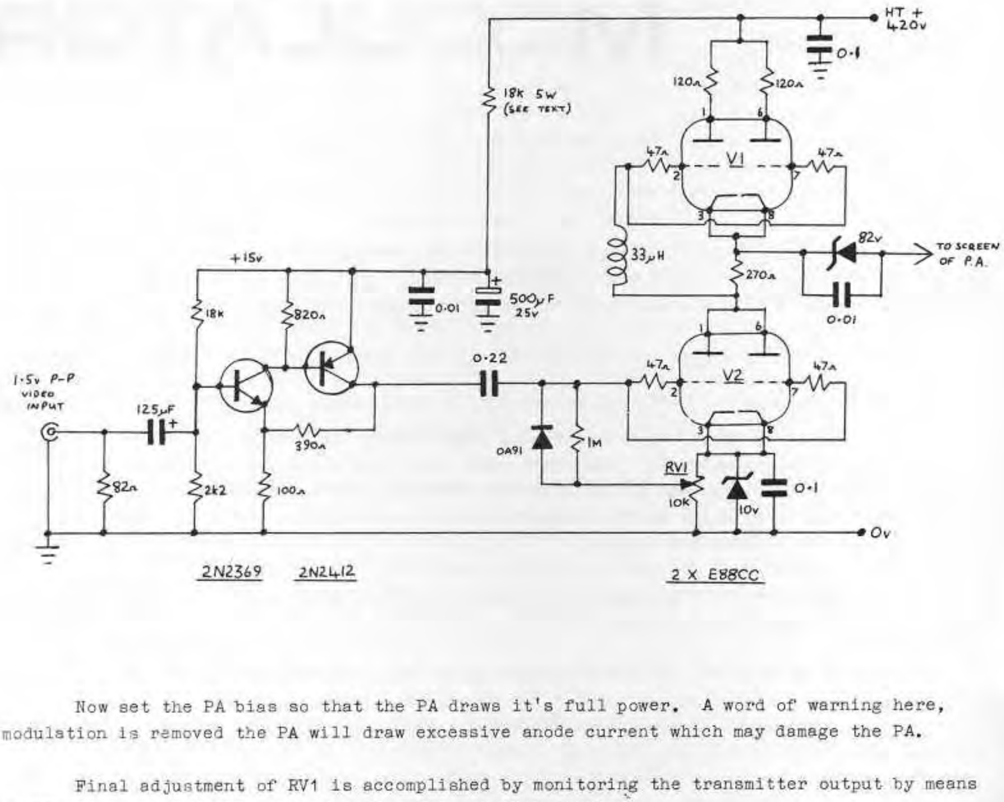
Apply +15 v to the transistor amplifier and feed composite video to the input, check with a 'scope that approximately 8 v p-p appear at V2 grids.

Apply HT to the output stage and with the 'scope check that the output can be varied by RV1 to approximately 200 v negative video.

It is difficult to quote specimen levels for setting up the PA of the vision transmitter as these will vary with the actual design used. But as a rule of thumb one should adjust the output of the modulator together with the PA bias for maximum downward indication on the PA anode current meter when modulation is applied, the current drop should be approximately 50% of that current drawn without modulation.

A "NEGATIVE" VIDEO MODULATOR

J. WOOD. G6AHT/T.



Now set the PA bias so that the PA draws it's full power. A word of warning here, if modulation is removed the PA will draw excessive anode current which may damage the PA.

Final adjustment of RV1 is accomplished by monitoring the transmitter output by means of an RF probe and a 'scope and adjusting for no flat topping.

The modulator can conveniently be built in a $4\frac{1}{2}$"x $3\frac{1}{2}$"x2" diecast box. All leads should be kept as short as possible and in particular the low value resistors at the grids and anodes of the valves should be wired right up against the valve base pins. A very short lead which may be coaxial is used to couple the modulator output to the PA screen grid.

AM sound ident can be added by feeding in $1\frac{1}{2}$v of audio and switching out the 82 ohm terminating resistor, however, when switching from video to sound be sure to adjust the PA bias to keep the anode current at a safe level since current maximum will occur with no modulation.

At least $1\frac{1}{2}$ v of video is required at the modulator input and since most cameras deliver only about 1v across 75 ohms a small pre-amplifier may be necessary.

AN AMATEUR TRIPOD.

by M.R. PERRY G8AKX

After purchasing a tv camera and going through the usual process of proping it up with books, boxes, etc., it was decided that some form of tripod was required.

My finances would not stretch to a new item and enquiries did not produce a second-hand one at the right price.

A commercial tripod was borrowed and it was found that the camera (Pye Lynx) put considerable strain on the pan stilt bearings and joints, so something more substantial was obviously required.

Thoughts then turned to whether one could be made using hand tools only, as lathes, drilling machines, welding gear etc. were not available.

A visit to the local scrap yard produced a collection of bits and pieces, from which the following tripod emerged. The article is not intended as a fully detailed construction to be copied by the letter, but an idea of what can be done with a bit of ingenuity, and to form a basis for ideas for the construction of a tripod at virtually zero cost from what can be found. As most of the bits were electrical conduit fitting there should be no problem; even if some of the bits are purchased the cost should be a lot less than a commercial tripod. (A word of warning: new electrical fittings are metric sizes whereas scrap items will almost certainly be imperial sizes.

CONSTRUCTION NOTES

The "U" pieces for the tilt head were bent from tin plate (cut from a 5 gallon oil drum) and were found to be rigid when 2" conduit box lids were used to give added strength.

To make the 5/16 bolt captive enabling the wing nut to be tightened one handed, one box lid is drilled 5/16 and the square of the coach bolt hammered through (this was found to give a tighter fit than filing a square hole, besides its quicker). The box lid is prevented from turning by a 2BA pin and nut through the lower "U" bracket.

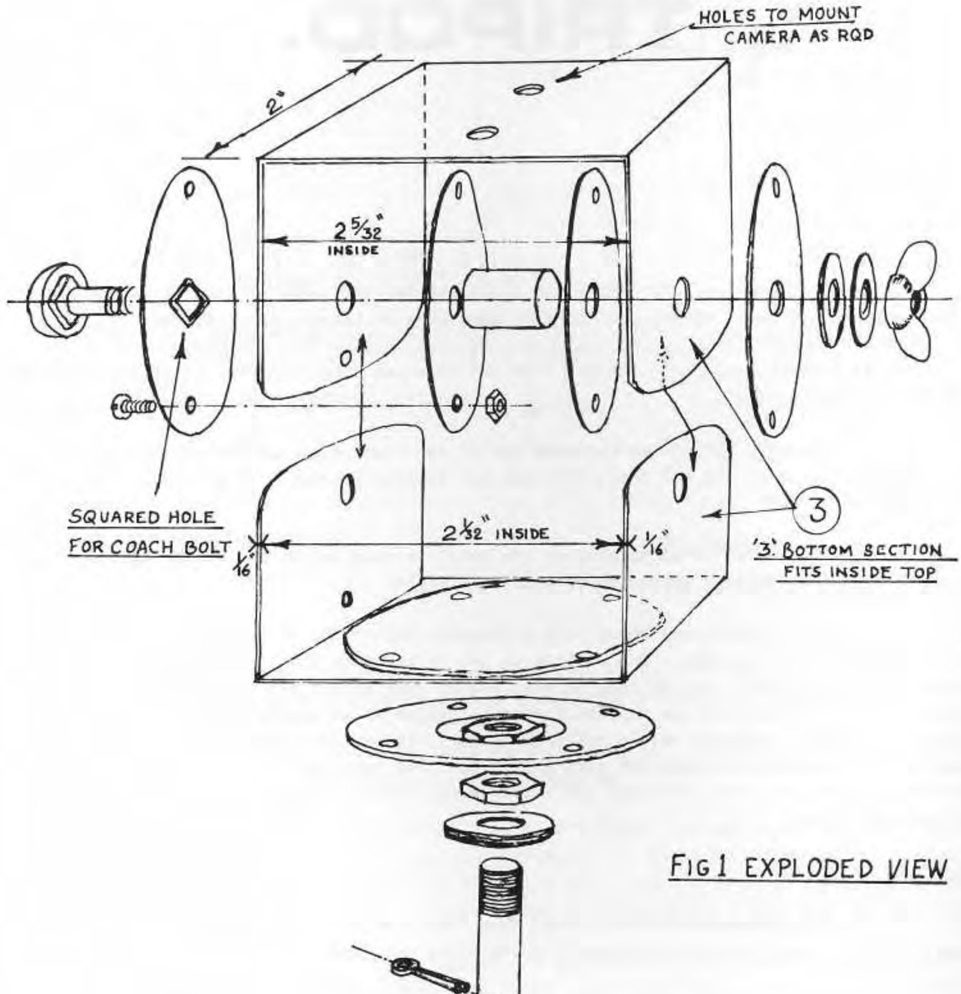


FIG 1 EXPLODED VIEW

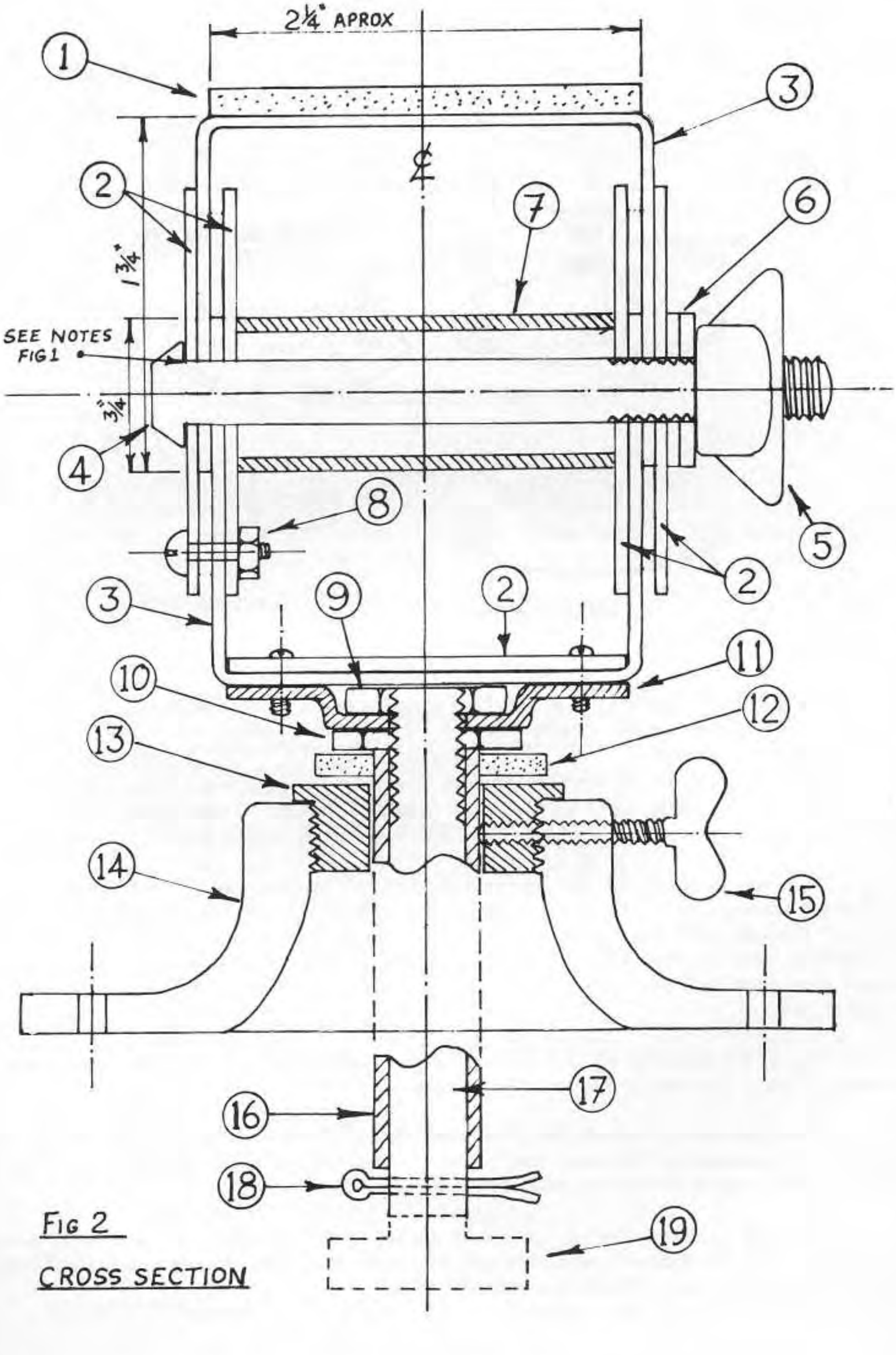
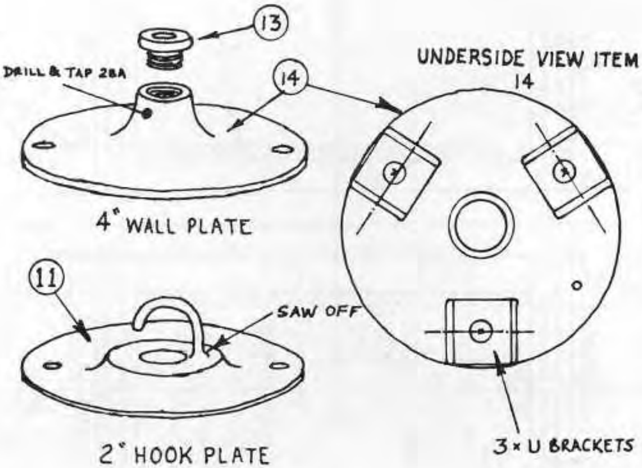


FIG 2

CROSS SECTION



It was found that a $\frac{3}{8}$ bolt just slid inside a piece of $\frac{1}{2}$" copper pipe so this formed the basis of the pan assembly.

By filing the end of the $\frac{1}{2}$" copper to a taper it can be forced into a short length of $\frac{3}{4}$ threaded conduit (the author used a brass male bush, but the inside diameter of these vary considerably and trouble may be found in obtaining one of the correct size).

The base to which the legs are attatched is a 4" diameter wall plate (used for swan neck light fittings) and the following order is recommended. Drill the plate so that there are 3 holes $\frac{1}{4}$" diameter 120° apart; file the end of the copper tube so that it will almost enter the bush conduit; screw the bush into the spout of the wall plate. Then force the copper pipe into the bush from underneath until it is rigidly held and square (taking care not to bend or kink the copper tube).

The author made the mistake of forcing the copper tube into the bush first, which expanded and would not then screw into the backplate.

If a largish vice is available the best way is to place it between the jaws and gently force it in by screwing up the vice. The "spout" is drilled and tapped so that a screw can be used to lock the head and stop it rotating when not required.

The legs were made from $\frac{5}{8}$ conduit and no adjustment in height was considered necessary in this case. The "U" brackets were bent from the base of $\frac{3}{4}$ spacer bar saddles. Or it could be made from $\frac{1}{8}$ strip about $\frac{1}{2}$" wide and about 2" long.

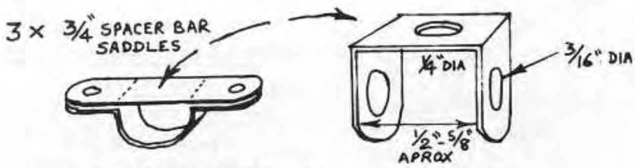


FIG 3 'U'BRACKETS FOR LEG SUPORTS

It was found by trial and error that a stop could be obtained to hold the legs at about 25 - 30^{o}. By using a round head $\frac{1}{4}$ bolt to hold the U bracket to the base of the $\frac{5}{8}$ conduit is then placed over the head of the $\frac{1}{4}$ bolt so it is the required angle. The conduit is then marked for the 3/16 hole to form a hinge using a 3/16 pin and nut. (Fig. 4).

A better method would possibly be to bend another piece of $\frac{1}{8}$ strip to form a stop as shown (Fig. 5).

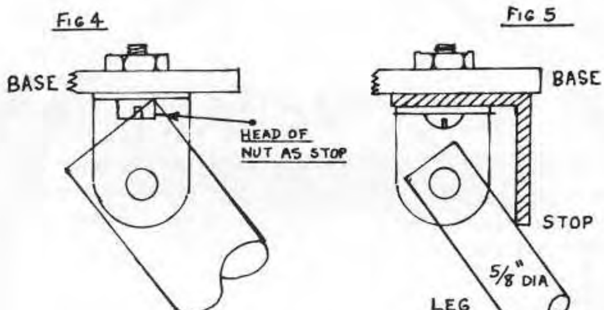


FIG 4 & 5 LEG STOPS TWO METHODS

In either case it is considered that the strain at this point, particularly on smooth floors when the legs tend to slide apart could cause something to give or brake. So about a third of the way down the legs are joined by lengths of light chain adjusted so as to be taut when the legs are correctly spaced apart. Fig. 2).

FINAL COMMENTS

If the 4" back plate is threaded all the way through, a more rigid assembly is shown

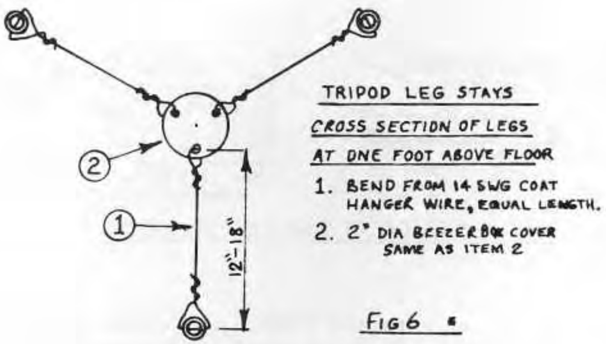


FIG 6

in Fig. 6. and if a rubber washer is placed between two metal washers, and this is slid over the $\frac{3}{8}$ bolt, and held under compression between the tilt assembly and base by the split pin or nut, then the camera can be easily turned but stays where it is put without having to lock it.

It can also form the basis of a table tilt and pan stand and it is intended to use something on the following lines so the same tilt head will fit either base.

ITEMS FIG. 2

1. $\frac{1}{2}$"x2"x2$\frac{1}{4}$" Rubber glued with rubber cement to top of pan x tilt head Item 3
2. 5x2" diameter beezer box cover plates/conduit box lids black matt or zinc plates
3. 2 x pieces 1/16" steel plate 2" wide x 6" long bent as shown in drawing to fit inside each
4. 5/16" diameter coach bolt and wing nut (5) + 2 washers (6)
5. Iwng nut 5/16"
6. 2 x washers 5/16" hole
7. Approximately 2" long $\frac{3}{4}$ diameter steel conduit or ($\frac{1}{2}$ ID BT Tube)
8. 2 BA or OBA friction adjust bolt and nut
9. Locking nut
10. Locking nut to item (11)
11. 2" diameter hook plate with hook sawn off flush
12. Rubber or Neoprin washer (tap washer?)
13. Male bush conduit type to fit item (14)
14. 4" diameter wall plate (cast steel)
15. 2BA pan lock wing bolt
16. 4" copper water pipe $\frac{1}{2}$ diameter (15mm)
17. $\frac{3}{8}$" diamter bolt 6" long (1" of thread or more)
18. Split pin to retain bolt shaft after assembly
19. Cut off head of bolt before assembly

A B.A.T.C. Test Card

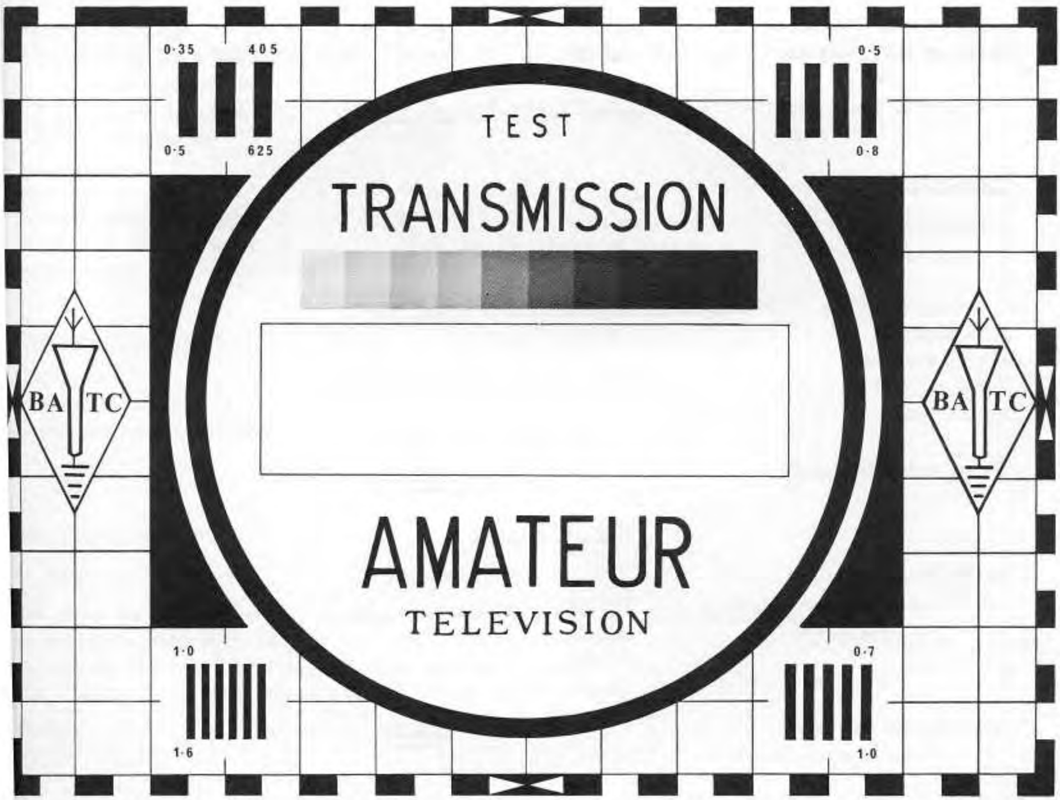
When working /T Stations over medium to long distances the normal test card, such as the EEV C. card, is too detailed to give meaningful results.

The new B.A.T.C. Test Card has been designed for use under less-than-perfect conditions and enables reporting to be more reliable and so more usful to the operator.

The card has been developed and drawn by Alan Antley, GW6AJT/T and is the result of extensive tests carried out between GW6JGA/T, GW6AJT/T, G6AGG/T and G6ADL/T, path distance of 5, 30 and 40 miles respectively. The help of these stations is gratefully acknowledged.

The card contains a circle, to check scanning linearity, definition blocks, various

continued on page 37



The British Amateur Television Club.

Statement of Accounts for the Year ended 31st December 1974

GENERAL ACCOUNT

INCOME	Year ended 31.12.74		Year ended 31.12.73	
Subscriptions: Current	921.85		795	
Arrears	14.20		15	
Sales of C Q - T V	127.95		130	
Advertising in C Q - T V	49.20		23	
Building Society Interest	80.05	1,193.05	51	1,014
Sales of SSTV Handbooks	456.00		136	
Sales of SSTV Booklets	46.00		109	
	502.00		245	
Less Costs, incl. Advertising	459.86	42.14	135	110
		1,235.19		1,124
EXPENDITURE				
4 Issues of C Q - T V	665.70		565	
Postage thereon	257.78		190	
	923.48		755	
Printing, Postages & Stationery	51.18		80	
Show Expenses	20.73		-	
A.G.M. Expenses	37.50		-	
R.S.G.B. Affiliation Fee	2.20		2	
Depreciation of Office Equipment	13.00	1,048.09	17	854
SURPLUS FOR THE YEAR		187.10		270

TRADING ACCOUNT

Sales of Equipment		191.73		266
Less Cost: Stock at 1.1.74	198.18		145	
Purchased	425.73		263	
	623.91		408	
Stock at 31.12.74	154.51	469.40	198	210
SURPLUS FOR THE YEAR		22.33		56

BALANCE SHEET AT 31st DECEMBER 1974

RESOURCES OF THE CLUB

Accumulated Fund	Year ended 31.12.74		Year ended 31.12.73	
Balance at 1st January 1974		1196.10		870
Surplus from General Account	187.10		270	
Trading Account	22.33	209.43	56	326
Balance at 31st December 1974		1405.53		1196
Represented by-				
FIXED ASSETS				
Office Equipment at 1.1.74	67.00			
Less Depreciation	13.00	54.00		67
CURRENT ASSETS				
Stocks: Trading	154.51		198	
C Q - T V Magazines	18.83		20	
SSTV Handbooks	87.16		-	
SSTV Booklets	50.00		21	
Stationery	19.23		25	
	329.73		264	
Debtors	45.60		23	
Balance with Bankers	72.94		285	
Balance on Giro Accounts	7.70		-	
Balance with Building Society	1269.52		989	
	1725.49		1561	
CURRENT LIABILITIES				
Creditors	84.96		92	
Subscriptions paid in advance	289.00		285	
Handbooks paid in advance	0.00		55	
	373.96		432	
NET CURRENT ASSETS		1351.53		1129
		1405.53		1196

The above Balance Sheet at 31st December 1974, together with the Trading and General Accounts for the year ended on that date, are in accordance with the books of the Club as produced to me and, to the best of my knowledge and belief, show a true and fair view of the position of the Club as at 31st December 1974 and of the results for the year.

BRIGG

28th March 1975

Chartered Accountant

B.A.T.C. EQUIPMENT REGISTER

Some time ago B.A.T.C. started the Equipment Registry as a Club service designed to help co-ordinate the exchange of surplus equipment between members. Since then many have found the service to be extremely useful, both for second-hand gear, and for those out of the ordinary items, and it is proposed to continue the Registry for as long as it appears to be necessary.

For the benefit of new members, or those who have not used the Registry before, this is how it works. A filing system is held by B.A.T.C., cross-referenced between two sections - "Wants" and "Surplus". Into the "Wants" section go details from the forms which members have filled in and into the "Surplus" section go similar details of all the equipment known to be available, either from members, or from manufacturers, tv companies etc. Wnen a requirement matches an availability, the members are put in touch with each other and left to sort out the purchases themselves. Every effort is made to ensure that contacts are only made where the price asked equals the price offered and for this reason we ask you specially to fill in the "price" column in the form. If you're not sure, put e.g. "approx. £1", or give a range e.g. £25 to £35. But don't leave us in the dark, unless you want to get cross with us for offering you a £55 camera when you only wanted a £10 one!

Members will be expected to reimburse B.A.T.C. for any costs incurred, although these will be kept to a minimum. It would also be appreciated if a stamped addressed envelope were included with each form, or at least a stamp. The postage costs for the Registry over the last year have been phenomenal!

As soon as you have obtained the equipment you wanted, or sold your surplus gear, do please inform the Registry so that you can be removed from the file. Otherwise the system will grind to a halt. So do help us to help you.

Don't worry if your request seems to be for the most unlikely piece of gear; it may still be possible to find it. Perhaps from a Company, or from the fantastic hoards that some amateurs have stored away somewhere, thinking that no one will ever want their "rubbish".

This service is for surplus equipment not for new; the Club has always operated a Club Sales section and continues to do so for new gear. Yokes, lens mounts, tubes badges etc. are all available and are advertised in every issue of this magazine by Grant Dixen, the Club Sales Officer. Please continue to use this non-profit making service.

continued on page 8

B.A.T.C. EQUIPMENT REGISTER

MEMBER'S REQUIREMENTS

Name ______________________ **Address** ______________________________

Call Sign __________________ ______________________________

Tel. No ____________________ ______________________________

Please insert the following requirements in the Club Equipment Register:-

Maximum price I am prepared to pay.

I agree to inform the Registry when the above requirements cease and pay 10% of the purchase price to B.A.T.C.

MEMBER'S SURPLUS EQUIPMENT

Name ______________________ **Address** ______________________________

Call Sign __________________ ______________________________

Tel. No ____________________ ______________________________

Please insert the following equipment, which is surplus to my requirements, in the Club Equipment Registry:

Price required

Cut here

An Index of Technical Articles from past CQ-TVs Part 3

CIRCUIT NOTEBOOK No 22

J. Lawrence GW6JGA'T

C - MOS

Complimentary Metal Oxide Semiconductor (C-MOS) Logic is now firmly established in the field of professional electronics. The most popular ranges are the CD 4000 AE 'COSMOS' series by R.C.A. and the equivalent MC 14000 'McMOS' series by Motorloa, other makers have some equivalents to these ranges.

The economy package is the 'E' or 'P' suffix, this is the plastic version with dual-in-line pins. The attraction of C-MOS digital I.C.s is their low power consumption (typically 10 nanowatts/gate), non-critical supply voltage (anything between 3 and 15 volts), high noise immunity etc.

C-MOS devices have a maximum operating frequency of about 6 to 10 MHz., which may be a limitation in some applications but is quite suitable for most A.T.V. requirements.

The Puls e Generator to be described grew from several experimental circuits tried out in order to gain experience of C-MOS.

The manufacturers warn that C-MOS is easily damaged by voltages from an un-earthed soldering iron, static electricity etc. and although it is prudent to observe these warnings this should not deter you from using them.

A Simple and Versatile Slow Scan and LODEF T.V. Pulse Generator

This pulse generator uses C-MOS devices and employs digital counting methods to generate all waveforms. It has provision for changing the number of lines per field and the system can be either non-interlaced or pseudo 2:1 interlaced. The only RC timing components are in the master oscillator. A suitable supply voltage is 5v. The I.C.s consume a total of 7mA and the transistor output stages 25mA each.

The Master Oscillator is run at 8 x line frequency and consists of 2 gates of I.C.5 connected im a conventional oscillator circuit. C1 can be selected to give the approximate frequency required and RV1 is used as a fine adjustment.

IC1 is a seven stage ripple counter in which the count takes place on the negative-going edge of the input waveforms. At zero count all Q outputs are at logic 0. After 8 input pulses Q4 changes to logic 1 and the output of IC2a changes to 0. The bistable formed is by IC2b and IC2c rests with IC2b output at 0 and IC2c output at 1. With a 0 input to IC2b, the

output of IC2b goes to 1. When the oscillator waveform goes to 1, IC2c output goes to 0, the output of IC2d goes to 1 and resets the counter, IC1 to zero.

The 1 output from Q4 falls to 0 and when the oscillator waveform changes to 0 the bistable IC2b and c returns to its resting state with IC2b output at 0 and IC2c output at 1.

It can be seen from the waveform that the pulse appearing at Q4 is one sisteenth of a line in duration and the pulse appearing at IC2b output is one eigth of a line in duration. These, when inverted by the transistor output stages, form the line sync and line blanking waveforms respectively.

The output of IC1 Q3 is a suare wave at line frequency and is fed to the line divider, ripple counter IC3. The actual number of lines is selected by connecting the appropriate Q outputs to the inputs of the 4 input gate, IC6.

The Q outputs are shown below:

Transition of logic 1	Q1	Q2	Q3	Q4	Q5	Q6	Q7
No. of input pulses	1	2	4	8	16	32	64

For example, if 120 lines were required Q4, Q5, Q6 and Q7 would be connected as shown in the diagram. At the count of 120 lines, all these Q outputs would be high (logic 1) and the output of IC6 woüld change to 0 resetting the counter as described in the case of IC1. The field sync output is a pulse of duration equal to one line.

If any of the inputs to IC6 are unused they must be connected to the +ve supply.

Field blanking is produced by the bistable formed byIC4c and IC4d. The bistable is set by the field sync and reset 4 lines later by the Q3 output of IC3, (the length of the blanking can be set to 4, 8 or 16 lines by choosing Q3, Q4 or Q5 for resetting).

INTERLACE STAGE

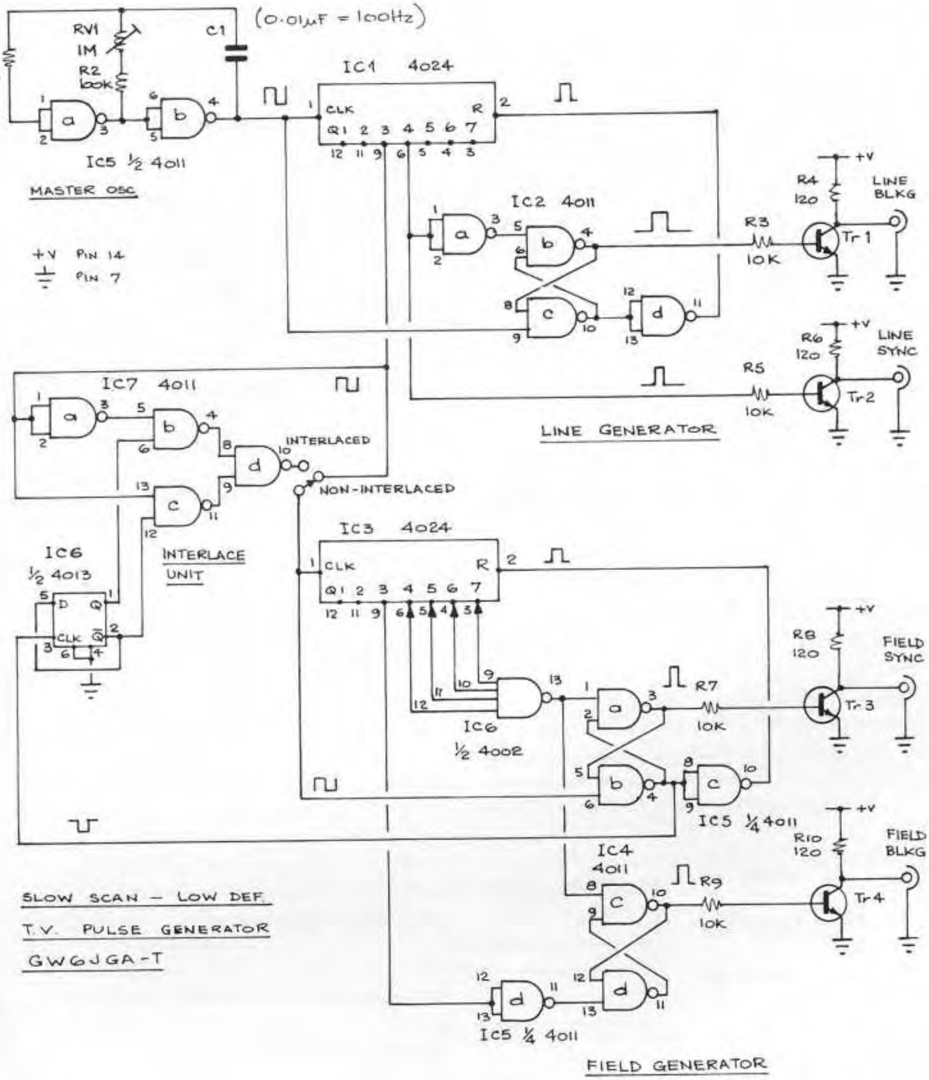
As previously described, the output from IC1, Q3 is a square wave at line frequency and IC3 clocks on the negative transition to logic 0.

The interlace stage consists of IC6 a clocked D-type flip-flop and IC7 connected as an inverting/non-inverting switch.

The D-type flip-flop has its D input connected to the $\bar{Q}$ output, this causes the flip-flop to change state with each clock (field) pulse input.

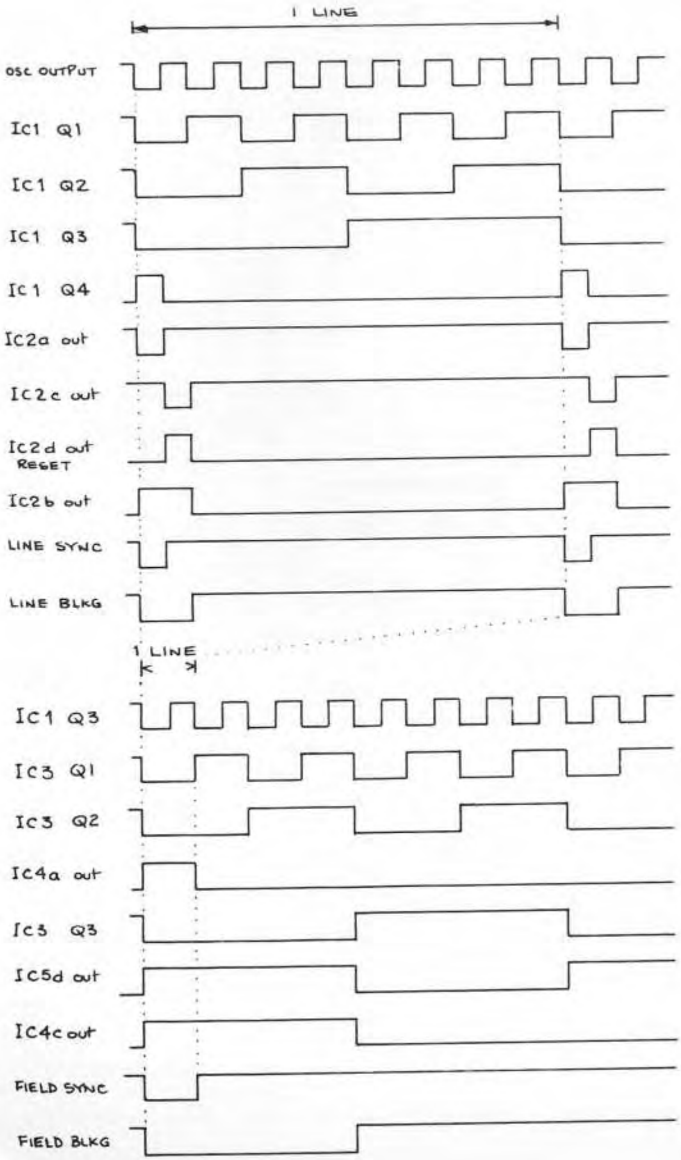
It will be seen that when $\bar{Q}$ is at 1 (and Q is at 0), the square wave input will pass through IC7c and IC7d. The signal is inverted twice and the output is in phase with the input. With Q at 1 (and $\bar{Q}$ at 0), the line square wave input is invetted 3 times (IC6a, IC6b and IC6d) resulting in the output of IC6d being in anti-phase with the input.

As the line divider, IC3 clocks on a negative transition it will be seen that as the phase of theinput to IC3 reverses each field it will generate a field sync pulse at the end of a


(0·01µF = 100Hz)
R1 10K
RV1 1M
R2 100K
C1
IC1 4024
CLK
R
Q1 2 3 4 5 6 7
IC5 ½ 4011
MASTER OSC
+V PIN 14
PIN 7
IC2 4011
R3 10K
R4 120
+V
LINE BLKG
Tr 1
R5 10K
R6 120
LINE SYNC
Tr 2
LINE GENERATOR
IC7 4011
INTERLACED
NON-INTERLACED
INTERLACE UNIT
IC6 ½ 4013
D
Q
CLK
IC3 4024
IC6 ½ 4002
R7 10K
R8 120
FIELD SYNC
Tr 3
IC5 ¼ 4011
IC4 4011
R9 10K
R10 120
FIELD BLKG
Tr 4
IC5 ¼ 4011
FIELD GENERATOR
SLOW SCAN – LOW DEF.
T.V. PULSE GENERATOR
GW6JGA-T

line on one field and in the middle of a line on the next, resulting in a pseudo 2:1 interlace.

Mixed blanking or mixed sync can be obtained by paralleling the output sockets.



References

1. COS/MOS Digital Integrated Circuits Databook SSD-203C £1.80 R.C.A. (includes application info.).
2. McMOS Handbook (applications and data) £2.50 Motorola.
3. McMOS Data Book £1.26 Motorola.
4. The Digital Integrated Circuit Shortform Catalohue. Free R.C.A.
5. Digital Integrated Circuits File No. 479 CD4000 Free R.C.A.
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continued from page 24

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AN IMAGE ORTHICON CAMERA

P. Hayes

PART 3

CONSTRUCTION OF SCANNING AND FOCUS COILS SEE FIG. 11

This is not an operation to be undertaken lightly. Professionally constructed coils cost several hundred pounds, so there is obviously a fair bit of work involved. However the principals are the same as for any other type of scan coil, e.g. vidicon. If an I.O. is available, construction can be made a lot easier. Firstly make a tube or former 3.2 ins. in diameter and about 13 ins. long out of stiff cardboard hardened with laquer or plenty of varnish to give it strength. The coils are made by winding wire on a frame or block of wood 10 ins. x 5 ins. each winding producing one coil; two coils are required for line and two for frame. The line coils are made of about 24swg enamelled copper wire, using about 60 - 70 turns for each coil, and the frame coils use about 30swg; about 120-130 turns should do. When they are ready the line coils are put on the former opposite each other as accurately as possible. Wind several turns of waxed paper or insulating tape over the coils, then place the frame coils on the former at right angles to the line coils, and wind some more paper or tape over them. The accuracy with which the coils are placed on the former has a very great effect on the geometry of the reproduced picture. The coils should be fitted to within $\frac{1}{2}$ ins of one end of the former. The alignment coils are made up in an identical manner, wound out of 24swg wire, on a frame or block of wood about 2 ins x 5 ins. Four coils are required, mounted in the same way as the scan coils, but at the other end of a former. Another cardboard tube is now made up of sufficient inside diameter to slip smoothly over the coils, and about 10 ins. long. Two cardboard discs are now made up , 7 ins. in diameter, with a hole cut out in the centre of sufficient diameter to be a tight fit with the unused former, and they are glued to either end of the former. This forms the frame on which is wound the bulk of the focus coil. A field strength of 70 gauss is required; if the former is nearly filled with 32-34swg wire, sufficient field strength should be obtained. Another former 4.6 ins. in diameter and 6.5 ins long with cheeks 7 ins. in diameter is made up in a similar manner to the focus coil, and filled with 32 or 34swg wire. A faceplate coil is also required; this is wound on another former $\frac{3}{4}$ ins long and with cheeks of the same size as the focus coil except that the central hole is 1.8 ins. in diameter, i.e. only a little larger than the photocathode. An arrangement to fix this facecoil in place after the tube is installed is made of clips which can conveniently carry the focus current. On the inside of the image section coil former are fitted five strips of metal, e.g. phosphor-bronze spring contacts from a vhf turret-tuner. These springs are to connect with the contacts around the tube neck, anc lead-out wires are soldered to them; the contacts are as follows; (looking at the tube from the base end and the keyway facing down, reading clockwise (1); field mesh
(2); photocathode
(3); G6 accelerator
(4); G5 decelerator
(5); Target

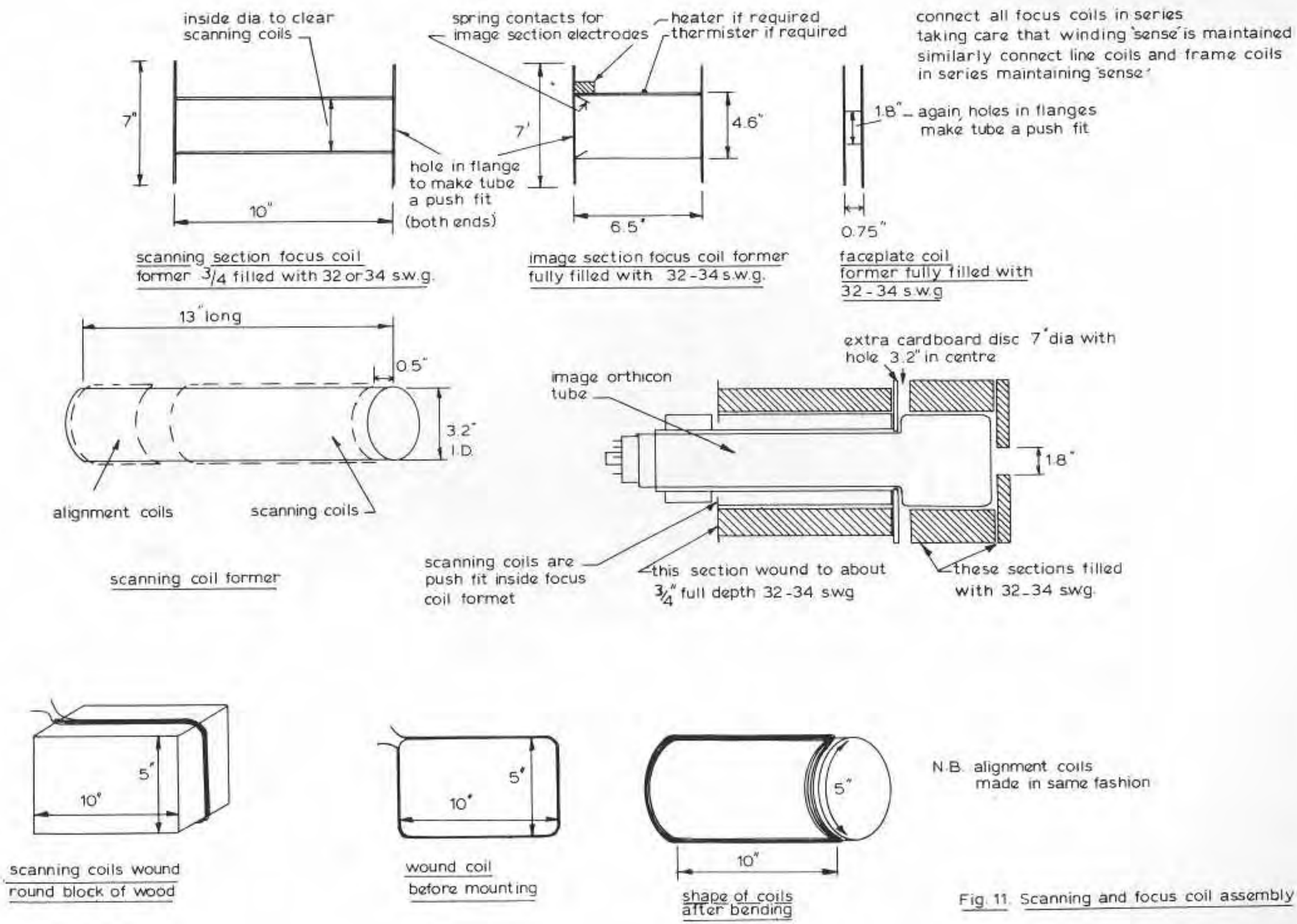

Fig. 11. Scanning and focus coil assembly

If a tube isto hand the positioning of the contacts is simple, if no tube is available fitting the contacts and final assembly will have to wait. To complete assembly, glue the two larger focus coils together with a cardboard disc 7ins. in diameter, and with a central hole 3.3ins in diameter. This allows the tube to go in as far as the image section, but prevents the scanning coils running too far up and hitting the glass of the tube. Finally, ensure the coils are connected in phase. If possible wind a single length of wire or copper tape on top of the scan coils, and on a former before the coils are mounted in the first place, a reduction of stray pickup, especially line scan ringing, will occur (the screen is earthed). Some commercial coils incorporate a target heater, and if desired to include one, proceed as follows. A heating element such as sold by Woolworths etc. using about 6ft, but best determined by experiment. The chosen length is wound on the image section focus former before winding the coil. The heater must be wound on the end with the image section connectoors, and take care to insulate it thermally as well as electrically from the focus coil. A thermistor is sometimes included as well; this can be put 2-3ins. away from the heater on the same former.

It is important to make various formers strong, as they will carry a fair amount of wire and will carry the tube. If it is possible to make the formers out of aluminium or copper a much stronger assembly will result. The focus coils are connected in series; it is unlikely that a focus current of 125mA will give the correct field strength, but ifthe current is adjusted until three beam focus nodes are obtained (using the component values shown in the focus circuit in Fig. 1) the current will be about right. The current also has a marked effect on the scan size and with the correct current the line scan circuit is capable of about 5-10% overscan at maximum output.

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